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(54) Chocolate Products With Increased Protein Content and  
Process for the Production of Such Type Products

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#### ABSTRACT

A chocolate product with increased protein content and having decreased carbohydrate content is disclosed. The product comprises substantially of a processed cheese and chocolate melt made perfectly homogeneous in a weight ratio of 1:1-1,5, being solid or semi-solid at environmental temperature. The carbohydrate content of the chocolate is partially replaced by decomposed milk (cheese) protein. This product is manufactured by mixing melted cheese with a chocolate melt at 50°C or higher temperature by intensive stirring and homogenizing the mass, which is allowed to solidify preferably after it is formed. The formed product can be immersed into chocolate to obtain a chocolate icing on the surface of the product.

CHOCOLATE PRODUCTS WITH INCREASED PROTEIN CONTENT AND  
PROCESS FOR THE PRODUCTION OF SUCH TYPE PRODUCTS

This invention relates to chocolate products with increased protein content and to a process for the manufacturing of such type chocolate products to increase the assortment of products of the sweets industry.

10 It is well-known, that among the products of the sweets industry chocolates and products containing purely chocolate, are the most favourable. Depending on the kind of the chocolate it contains 40-60 weight % carbohydrate whereas the carbohydrate content of the products of the sweets industry with chocolate-  
content or chocolate icing is still greater as mentioned. Chocolates contain in addition to carbohydrate alkaloids as well e.g. theobromine, tannin-derivatives (cocoared, catechine), further mineral substances, which are physiologically useful and easily digestible.

20 Many experiments were made to increase the protein and to reduce the carbohydrate content of chocolates maintaining at the same time their deliciousness. These experiments, however, failed and therefore the proportion of the protein could not be increased to the expense of the carbohydrate. Chocolates form a heterogenous, polydisperse system, which contains sugar dispersed in cocoa-butter, cocoa-starch and other solid components, e.g. mineral substances. The cocoa-butter - as dispersing medium - is solid at room-temperature. The viscosity of the dispersing



medium depends on the proportion of the cocoa-butter at a given temperature, as well as of the quantity of additives which are reducing the viscosity of the product. Chocolate has a lyophobic character and cannot absorb more than 2-3 weight % of water.

The homogeneity of the chocolate mass is destroyed, if it contains more than 5 weight % of water. Under influence of the water the sugar content of the chocolate dissolves and the formed sugar-syrup is not able to redispergate in the dispersing medium, which is the cocoa-butter. Consequently small water- and fat droplets form within the originally homogeneous chocolate mass at 32°C.

The dishomogeneous chocolate mass cannot be processed further and it becomes lumpy. This is the reason why chocolates could be enriched, or mixed respectively, with anhydrous substances or substances only containing very small water e.g. dried milk, roasted and milled seeds. This is the method which is suitable to produce milk-chocolate, and whole-nut-chocolate. If chocolate is mixed with substances having great water content, then this water content should be eliminated by heating during the refining process. If the water content of the chocolate is greater than the usual, the substance becomes lumpy and the sense of taste becomes gritty.

For flavouring the products of the dairy industry small quantity of chocolate are used some times, these products, however, have a taste character and consistency of milkproducts. /Chocolate with milk, querc/cottage cheese/products with chocolate icing/.

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This invention relates to a novel chocolate product and to a process for producing a new chocolate-product wherein the chocolate character dominates and at the same time it is delicious with increased protein and reduced in carbohydrate content.

It was recognized that molten chocolate contacted with processed cheese, can be homogenized and the yielded product has a great deliciousness and a pleasant taste.

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The chocolate product, according to the invention, which is rich in protein and reduced in carbohydrate content can be characterized by consisting essentially of homogeneous mixture of processed cheese and chocolate at a weight ratio of 1:1-1.5 having a chocolate character, forming solid or semisolid consistency at room temperature containing dipeptides, peptides, amino acids and sodium caseinate characteristic to cheese protein at the expense of the carbohydrate content.

According to one aspect of the present invention there is provided a process for preparing a chocolate product with increased protein content, which  
10 process comprises mixing melted cheese with a chocolate melt at a temperature of 50°C or higher, homogenizing the mixture, and allowing the mixture to solidify. Preferably the shaped product is coated with chocolate or plain chocolate. The melting of the mass is performed as quick as possible. The components contacted are cooled while stirring and thereafter with the help of a freezing apparatus the homogenized mass is solidified at -10°C or even at a lower temperature. The mixture preferably contains an emulsifier.

According to another aspect of the present invention there is provided a chocolate product, with increased protein content, having decreased carbohydrate content, consisting essentially of a homogeneous mixture of a processed  
20 cheese and chocolate in a weight ratio of 1:1-1.5, having a solid, or semisolid consistency at environmental temperature, wherein the carbohydrate content of the chocolate is partially replaced by dipeptides, peptides, amino acids and sodium caseinate containing decomposed milk protein (cheese protein), the product contains 20-25 weight percent water and 10-20 weight percent protein (according to kjeldahl).

According to an alternative process the homogenized components are kept to cool. The ratio of the processed cheese and

chocolate melt may be adjusted in a way to form a homogeneous mass at a given temperature. Selecting a proper proportion of the processed cheese and chocolate melt e.g. to 1 : 1.5 weight ratio, the homogeneity of the final product may be attained. However it may be deviated from the mentioned weight ratio, as well as in relation of the processed cheese and of the chocolate melt. The chocolate, or the cocoa mass may contain in 0,1-2,0 weight % emulsifiers acceptable in the food industry e.g. diglycerids or lecithine.

10                   The chocolate component can be eating chocolate, milk chocolate, bitter chocolate, cocoa mass or chocolate icing, which is made from powdered cocoa, sugar and fats similar to cocoa-butter. As chocolate can be used white chocolate which is composed of cocoa-butter and sugar.

                  The processed cheese can be of different basic material e.g. hard cheese, semi-hard cheese and/or soft cheese, which is processed with emulsifying salts used generally in the dairy industry. Cheeses with great dry matter content, e.g. cheeses with over 46 weight % dry matter content are preferred. The  
20                   amount of the emulsifying salt based on the cheese material, can be 1 to 4 weight %. If, however processed cheeses are used, then the amount of the emulsifying salt can be reduced. The suitable emulsifying salt or mixture of emulsifying salts respectively are the following: citrate, disodium-hydrogen-phosphate, monosodium phosphate, neutral pyrophosphate, polyphosphate, mono-orto-diorthophosphate, neutral-acidic pyrophosphate,

orthophosphate+pyrophosphate, orthophosphate+polyphosphate, pyrophosphate+polyphosphate, ortho-pyro+polyphosphate, ortho-pyro+polyphosphate+citrate (Joha\* S4, Joha\* S4SS, Joha\* S9, Joha\* S 90, Joha\* 8, Joha\* P2, Joha\* T, Joha\* K, Solva\* 42, 62,70,82,85,100). The proper pH-value of the mixture from the selected cheese material and emulsifier salt can be determined by a pilot processing. For adjustment of pH-value citric acid and/or citrate can be used also. The pH-value of the processing should be regulated so, that during the pilot processing fat or water separation does not occur. It is suitable, to adjust the pH-value of the processed cheese between 5 to 7. The softening of the melt can be effected in  
 10 given case with honey (nectar of flowers) or with starch syrup. Before forming the homogenized mass spice, spice-extracts natural and synthetical flavouring substance (sweet orange oil) acids, e.g. lactic acid, citric acid or tartaric acid or granulous enriching material e.g. sweetened fruits or vegetables can be added to the mass.

Chocolate can be replaced partly by nougat or nougatlike substance. The cheese material, if desired, can be enriched with other concentrated milk protein products. Such a product may contain e.g. 75 weight % of milk protein, 12 weight % of lactose and 8 weight % of milk minerals. As such product may serve sodium caseinate as well.

20 The chocolate mass produced can be poured into moulds (small plate, cube, chocolate creams, chocolate capsule etc.) which are also furnished with rodlet and



are sold immersed in natural chocolate as suckers/Lollipop/.

It was recognized that the liophobic chocolate can be homogenized, if the chocolate melt is mixed at a temperature of 50°C with processed cheese, which may contain even 54% of moisture content, mixing is performed gradually in equal proportions and at the end the chocolate mass forms a homogeneous mass with the cheese. Structurally, the cheese is originally of gel formation character which easily transforms into sol structure under influence of temperature. The gel textured cheese, if even in small pieces, cannot be homogenized with chocolate. The reasons are mentioned in the introductory part of this specification. Likewise, the cheese when heated and transformed into sol cannot be homogenized, if it is added to chocolate mass or chocolate melt, respectively, at a lower temperature than 50°C. The liquid mass separates into fat and water droplets, however, during the solidifying it becomes inhomogeneous, the consistency is at tasting very grainy, /gritty/.

Attempts have been made to prepared chocolate in which solid pieces of cheese are dispersed. Conventional natural cheese or processed cheese and other goods comprised mainly of cheese have, however, very bad preservation properties and are subjected to the appearance of mold and the liberation of fats in a short time. Therefore, when pieces of cheese cut to adequate size are incorporated into chocolate, a so called oil-blooming phenomenon occurs, wherein white lines or greasy spots of fat, derived from the mixed melting of fat, liberated from the surface of the cheese

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with cocoa oil of the chocolate, appear. At the same time a so-called sugar-blooming phenomenon occurs as well, wherein the sugar contained in chocolate is dissolved into the water liberated from the cheese, the water is vaporized, then the sugar crystallizes on the surface of the chocolate. Due to this phenomenon, the volume of the cheese contained in the chocolate decreases, spaces between cheese and the chocolate are formed, and mold may grow in the spaces.

10       Owing to these phenomena water and the oil in the cheese is diminishing, the balance of amount of components in the cheese is destroyed and the cheese hardens and has a bad taste when eating. The disadvantages mentioned hindered the production of chocolate which contain solid cheese. According to the invention however a homogenized mass can be prepared, preferably, at a temperature higher than 50°C, which can be solidified after homogenization. Thereby the protein content of the chocolate product, according to this invention, can be enriched up to 20 %, which means a signification high protein content, as compared to the customary chocolate products, which contain at most 6-7 weight  
20   % protein. The increase of the protein content of the chocolate products, according to this invention, is in correlation with that circumstance too, that cheese protein - comparing it to other milk proteins - already contains the casein partly in a decomposed state. Partly the dipeptide, peptids and amino acids present, partly the non-decomposed casein, which instead of calcium is bound to sodium, provide those structural characters, which contribute to the advantages of the chocolate products of this invention. These products are able to bind different addi-

tives, on the other hand, when eating they can be easier digested.

The content of the cheese protein in the chocolate product, according to this invention can be determined on basis of the relative casein content. The principle of this method is, that the rate of the all-nitrogen contained substances in the cheeses solution should be compared with the nitrogen content obtained by precipitation with alum, tested by the method of Kjeldahl. This method is described by the authors Schulz and Mrowetz (Deutsche Molkerei Zeitung 73 /18/ 495/1952). Likewise, also can be used for the determination of the rate of the protein breakdown product in the cheese protein, a determination of the so-called "formoltiter".

According to this method, the test material, should titrated wit sodium hydroxide of 0,1 normality, using phenoph-talein indicator, thereafter formaldehyde solution is added and is titrated up to the pH-value of 8,3. Thus the formoltiter of the test material can be obtained, which should be calculated on the solids-non-fat (s.n.f.) content of the test calculated material. During the cheese ripening, as a result of protein (casein) breakdown, the amount of the free amino groups is increased therefore the formoltiter value of the cheese or processed cheese increases as well.

The advantages of the process according to the invention, can be summarized as follows:

1. A chocolate product can be manufactured with increased protein content having high nutrition value and the product meet the

requirements of the modern nourishment.

2. The assortment of sweets industry products can be implemented by means of products having new composition, agreeable consistency and novel flavour effect.
3. The carbohydrate content of the chocolate, according to this invention, can be decreased advantageously in favor of the protein content.
4. The products produced with cocoa mass contain no sugar, therefore it can be consumed as diabetic product too.
- 10 5. It is possible to utilize processed cheese for sweets industry purposes.

The invention is further demonstrated by the following examples:

EXAMPLE 1

150 g of bitter chocolate was melt by stirring. Its temperature is adjusted by slow warming to 55-60°C. Separately from the chocolate melt 150 g of semi-hard cheese is processed by adding into 1,2 weight % of Solva 85 emulsifying salt. The quality and amount of the emulsifying salt is determined by  
20 a pilot processing. During the processing of the cheese the temperature was raised to 80-85°C and was stirred, then while stirring the melt during cooling the bitter chocolate melt was added which was prepared in a separate vessel. Both components were homogenized at 55°C by stirring and then formed. Thereafter was rapidly solidified by means of a freezing apparatus at -10°C or even lower temperature. The product was removed from the mould and immersed into chocolate or plain chocolate mass for covering

the surface thereof.

EXAMPLE 2

200 g of eating chocolate having customary quality was melted and warmed to 55-60°C. In a separate vessel to 150 g of processed cheese 0,5 weight % of Joha T emulsifying salt was added, then processed at 80-85°C. The quality of the emulsifying salt is determined by a pilot processing. The processed cheese is mixed into the melted eating chocolate at 60°C, to which previously was added 0,2 weight % of mono-glyceride emulsifier. To the homogenized mass granulous sweetened fruit or vegetables, was added in warmstate then the corpus, was solidified. The product removed from the mould was immersed into chocolate, and the covered product was then packed.

EXAMPLE 3

250 g of milk chocolate was melted, then heated to 55°C and calculated on its weight 2,20 % lecithine was incorporated into the melt. In separate vessel to 125 g of a mixture consisting of semi-hard cheese and processed cheese 1,4 % of di- and poly-phosphate emulsifying salt mixture was added. The cheese processed at 80°C temperature, then it was adjusted with disodium citrate to pH-value of 7,0. It was incorporated into the chocolate melt, then formed in melt form. The formed material was furnished with a lolly and at -15°C temperature it was solidified by means of a freezing apparatus. From the mould the product was removed and immersed into chocolate, then the covered product was packed.

EXAMPLE 4

180 g of cocoa mass was melted, then heated to 60°C. A mixture of mono-diglyceride 0,6 weight % calculated on the mass was added. In a separate vessel 300 g of semi-hard cheese was prepared and processed, then after processing the pH-value was adjusted to 6,5. 2,5 Weight % of Joha S9 emulsifying salt was added, then it was processed. The processed cheese was mixed into the melted cocoa mass and was sweetened with fructose. In place of fructose also sorbite and artificial sweetening agent can be used. The mass was formed then solidified while freezing. The product removed from the mould was immersed into natural or diabetic chocolate and the covered product was packed.

EXAMPLE 5

A mass consisting of 100 g of powdered cocoa, sugar and fat similar to cocoa-butter was heated to 55°C. Calculated on its weight 1 % emulsifier was added to it. In separate vessel 100 g of cheese was processed with 1.5 % of emulsifying salt, thereafter the components were homogenized in a heated state then was filled into a mould and was allowed to solidify.

EXAMPLE 6

The process of example 1 was repeated with the difference, that to the processed cheese, 20 % of milk protein concentrate was added. This concentrate  
10 contains 75 % of protein, 12 % of lactose, 8 % of milk minerals and 5 % of water.

EXAMPLE 7

100 g of a mass prepared from powdered cocoa, sugar, cream, and butter, was heated to 60°C and 1.2 % of emulsifier was added. To this melt 100 g processed cheese was added then the mass was homogenized and formed, finally solidified.

EXAMPLE 8

750 g of half bitter chocolate is heated to 55°C under stirring. 375 g of dust fine cheese powder and 1.0 g of emulsifier /monoglyceride/ were added to the melt under stirring and the mixture was homogenized at the temperature of the  
20 chocolate. When homogenized, the mixture was formed and was allowed to solidify at ambient temperature. The formed product was immersed into half bitter chocolate and was packed.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A process for preparing a chocolate product with increased protein content, which process comprises mixing melted cheese with a chocolate melt at a temperature of 50°C or higher, homogenizing the mixture, and allowing the mixture to solidify.
2. A process according to claim 1, wherein the solidified product is coated with chocolate or plain chocolate.
3. A process according to claim 1, wherein the mixture further comprises an emulsifier.
4. A process according to claim 1, 2 or 3, wherein the chocolate melt comprises cocoa mass or plain chocolate.
5. A process according to claim 1, 2 or 3, wherein the cheese is processed cheese containing an emulsifying salt.
6. A process according to claim 1, 2 or 3, wherein the ratio of the chocolate melt to the processed cheese is from 1-1.5:1.
7. A process according to claim 1, 2 or 3, wherein 1 to 2% by weight of a suitable emulsifier is added to the chocolate.
8. A process according to claim 1, wherein the chocolate is eating chocolate, white chocolate, bitter chocolate, milk chocolate, or a mixture comprising powdered cocoa, sugar and fat.
9. A process according to claim 8 wherein the chocolate contains nougat and the cocoa contains roasted and milled Saint John's bread.



10. A process according to claim 1, 2 or 3, wherein the cheese is a cheese containing 10 to 35 weight % of milk protein concentrate.
11. A process according to claim 1, 2 or 3, wherein the cheese is a hard, semi-hard, or soft cheese.
12. A process according to claim 3, wherein the mixture comprises 1 to 4% by weight of emulsifier, calculated on the weight of the cheese.
13. A process according to claim 1, 2 or 3, wherein the pH-value of the cheese is adjusted to equal the pH-value of the chocolate.
14. A process according to claim 1, 2 or 3, wherein the chocolate is cocoa containing added artificial sweetener, fructose or sorbite.
15. A process according to claim 1, 2 or 3, wherein the cheese is ground, grated or dust fine, hard, semi-hard or soft cheese.
16. A chocolate product, with increased protein content, having decreased carbohydrate content, consisting essentially of a homogeneous mixture of a processed cheese and chocolate in a weight ratio of 1:1-1.5, having a solid, or semi-solid consistency at environmental temperature, wherein the carbohydrate content of the chocolate is partially replaced by dipeptides, peptides, amino acids and sodium caseinate containing decomposed milk protein (cheese protein), the product contains 20-25 weight percent water and 10-20 weight percent protein (according to kjeldahl).

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